Action Item
Agenda Item No. 5

Report to the Auburn City Council

City Manager's Approval

To:	Mayor and City Council Members
From:	Reg Murray, Senior Planner
Date:	April 9, 2012
Subject:	Sierra Business Council Presentation – Auburn Community-Wide Greenhouse Gas Emissions Inventory

The Issue

The Sierra Business Council will present an overview of the Auburn Community-Wide Greenhouse Gas Emissions Inventory and relevant findings.

Conclusions and Recommendation

Informational Only - No action is requested or required.

Background/Analysis

In October, 2010, the Auburn City Council approved the City's participation in the Green Communities Program. The Green Communities Program is a multi-phase program approved and overseen by the California Public Utilities Commission (CPUC), administered by Pacific Gas and Electric (PG&E), and implemented in the Sierra Nevada region by the Sierra Business Council (SBC). The first phase of the Program provided a Greenhouse Gas Emissions (GHGE) inventory of the City's government operations circa 2005. The City Council received the Phase 1 inventory on March 14, 2011.

Following completion of the Phase 1 inventory, SBC invited the City to participate in Phase 2 of the Green Communities Program by offering to develop a community-wide GHGE inventory for Auburn. On August 14, 2011, Council authorized the City's participation in the Phase 2 Program. Since that time, staff at the Sierra Business Council, with assistance from City staff, compiled data from a number of different sources and finalized the inventory report. The report (Attachment 1) identifies the general methodology of the study and details the results. The inventory identifies the Transportation sector as being the largest contributor of emissions for the Auburn community. The report by SBC also suggests how the City can use the inventory as well as possible future steps the City can take if it wishes to pursue emissions reductions at the local level.

The Sierra Business Council will provide a presentation to Council regarding the Program and the findings of the GHGE Inventory.

Fiscal Impacts

Participation in the Phase 2 inventory resulted in no direct costs to the City. The Program was funded by California utility customers and administered by PG&E under the auspices of the California Public Utilities Commission. The City committed staff hours to participate in the program, which included training, providing information to the SBC, coordination of data collection, and review of program documents.

Additional Information

Please see the following for more details:

ATTACHMENTS

1. GHG Phase 2 project description
2. Auburn 2005 Community-Wide Greenhouse Gas Emissions Inventory 2011 (March 2012)

City of Auburn

2005 Community-Wide Greenhouse Gas Emissions Inventory

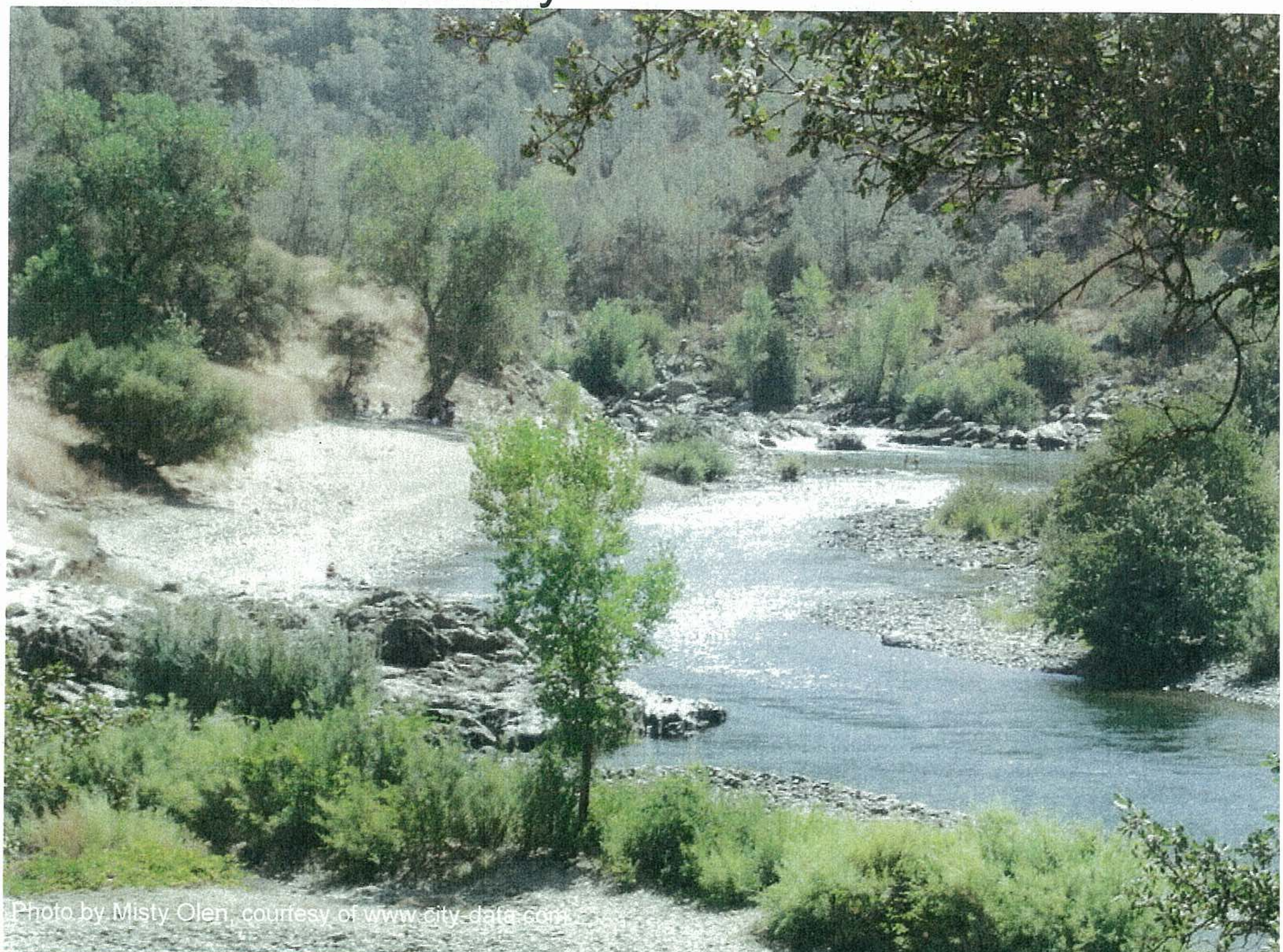

Photo by Misty Olen, courtesy of www.city-data.com

Narrative Report

Produced by Sierra Business Council
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ICLEI-Local Governments for Sustainability USA
March 2012

Credits and Acknowledgements

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Pacific Gas and Electric Company provides a range of climate planning assistance to local governments, from providing energy usage data and assistance with greenhouse gas inventories, to training and guidance on the development and implementation of climate action plans.

This program is funded by California utility customers and administered by PG&E under the auspices of the California Public Utilities Commission.

ICLEI-Local Governments for Sustainability USA

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This report was prepared for the City of Auburn by the Sierra Business Council, in partnership with PG&E and ICLEI. The authors would like to thank the City of Auburn's staff for providing much of the insight and local information necessary for the completion of this report. The authors would also like to recognize PG&E for their administrative support of the inventory, made possible through the use of Public Goods Charge funding, as well as thank ICLEI for providing training and technical support.

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Executive Summary

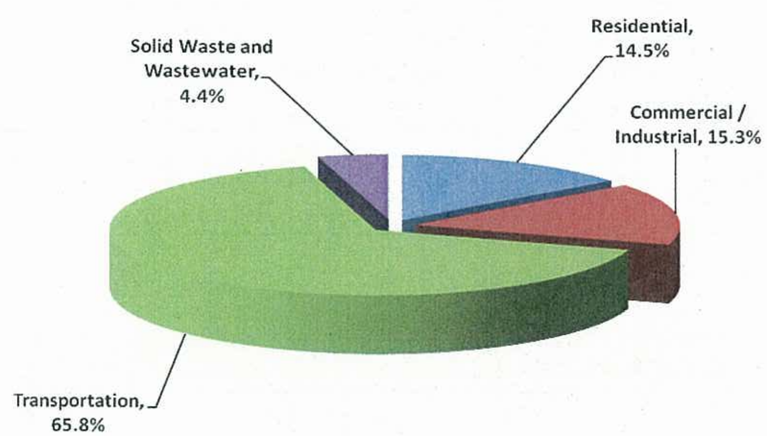
Available information indicates that greenhouse gas (GHG) emissions from human activity are contributing to climate change, the consequences of which could pose risks to the future health, well-being, and prosperity of our community. By implementing GHG emissions reduction strategies, the City of Auburn can help to lower residents' and businesses' energy bills, reduce transportation costs, improve air quality, as well as enhance the efficiency of municipal services such as waste disposal and wastewater treatment, while reducing costs.

The City of Auburn has begun the climate action planning process, starting with inventorying emissions. The City of Auburn completed an inventory in 2010 of GHG emissions from government operations. This report estimates the 2005 greenhouse gas emissions resulting from activities in the community of Auburn as a whole.

Key Findings

As can be seen in Figure ES-1, the largest contributor to community emissions was the Transportation sector with 65.8% of total emissions. The next largest contributor was the Commercial/Industrial sector with 15.3% of total emissions. Actions to reduce emissions in both of these sectors will be a key part of a climate action plan. Waste and Residential sectors were responsible for the remainder of emissions.

Figure ES-1: Community GHG Emissions by Sector



The Inventory Results section of this report provides a detailed profile of emissions sources within the City of Auburn; information that is key to guiding local reduction efforts. This data will also provide a baseline against which the city will be able to compare future performance and demonstrate progress in reducing emissions.

Introduction

Every day, the City of Auburn plays host to a variety of activities necessary for ensuring a properly functioning and robust community. These activities include burning fuel for transportation, collecting and treating waste, generating power, and providing light and heat for buildings. All of these activities either directly or indirectly contribute to the addition of carbon dioxide and other greenhouse gases into the environment. This report presents the findings and methodology of a community-wide greenhouse gas emissions inventory for the City of Auburn using 2005 as the base year for the study.

The City of Auburn is located at the crossroads of I-80 and Highway 49 and serves at the seat of Placer County. It encompasses approximately 7.5 square miles, is situated at elevations ranging from 1,000 to 1,400 feet, and had a population in 2005 of 12,971.

Climate Change Background

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Evidence indicates that human activities are increasing the concentration of greenhouse gases and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise.

Many communities in the United States have taken responsibility for addressing climate change at the local level. The City of Auburn's economy and quality of life for its residents could be impacted by risks associated with climate change. Current and expected impacts to the City of Auburn related to climate change are explained below. Beyond the City of Auburn, climate scientists expect changing temperatures to result in more frequent and damaging storms accompanied by flooding and landslides, summer water shortages as a result of reduced snow pack, and the disruption of ecosystems, habitats, and agricultural activities.

Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. Additionally, money not spent on energy is available to be spent at local businesses and add to the local economy. Reducing fossil fuel use can improve the health of local residents by improving air quality and increasing opportunities for walking and bicycling.

Regional and Local Impacts

The City of Auburn, like other communities in the Sierra Nevada, faces unique challenges associated with climate change in the region. Forests face the threat of increased catastrophic wildfires, introduction of new diseases, altered species composition and other effects of rapid landscape transformation. Potential impacts on water resources include reduced snowpack, delayed snow accumulation, earlier snow melting, and ultimately shortages in runoff and water supply. Increased frequency and altered timing of flooding will increase risks to people, ecosystems, and infrastructure. With rapid change, loss of critical habitat and alteration of fragile ecosystems is likely. Since local economies in the Sierra Nevada rely so heavily on these natural resources for tourism, recreation, forestry, agriculture and other industries, climate change has the potential to negatively affect economic activity in the City of Auburn, and ultimately impact quality of life for its residents.

Evidence of Human-Caused Climate Change

Scientific information indicates that the global climate is changing, and that human actions, primarily the burning of fossil fuels, are the main cause of those changes. The Intergovernmental Panel on Climate Change (IPCC) is the scientific body charged with bringing together the work of thousands of climate scientists. The IPCC's Fourth Assessment Report states that "warming of the climate system is unequivocal."[1] Furthermore, the report finds that "most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations."

Analysis released in January 2011 by NASA's Goddard Institute for Space Studies shows that global average surface temperatures in 2010 "tied" 2005 as the warmest on record (the difference is smaller than the uncertainty in comparing the temperatures of recent years).[2] The

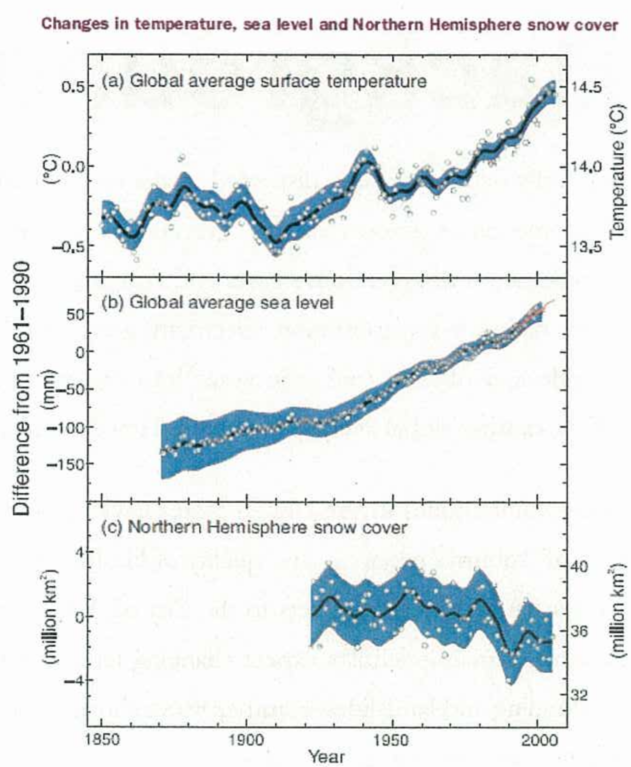


Figure 1: Observed changes in global temperature, sea level and snow cover.

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[1] IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

[2] Goddard Institute for Space Studies, "Research Finds 2010 Tied for Warmest Year on Record," 2011, 18 Jan. 2011, <http://www.nasa.gov/topics/earth/features/2010-warmest-year.html>.

next hottest years, also with very close average temperatures, are 1998, 2002, 2003, 2006, 2007, and 2009. The period from January 2000 to December 2009 is the warmest decade on record, followed by the 1990's, then the 1980's respectively. The steady uptick in average temperatures is significant and expected to continue if action is not taken to greatly reduce greenhouse gas emissions.

California Policy

California passed the Global Warming Solutions Act (AB 32) in 2006, which charged the California Air Resources Board (CARB) with implementing a comprehensive statewide program to reduce greenhouse gas emissions. AB 32 established the following greenhouse gas emissions reduction targets for the state of California:

- 2000 emissions levels by 2010
- 1990 emissions levels by 2020

Additionally, the passage of SB 375, which requires CARB to develop regional greenhouse gas emission reduction targets for passenger vehicles, enhances California's ability to reach its AB 32 goals by promoting good planning with the goal of more sustainable communities. CARB is to establish targets for 2020 and 2035 for each region covered by one of the State's 18 metropolitan planning organizations (MPOs). Another policy driver for climate action planning in California is SB 97, which established that GHG emissions and their impacts are appropriate subjects for analysis under the California Environmental Quality Act (CEQA). This law directed the State's Office of Planning and Research (OPR) to develop CEQA guidelines on the mitigation of greenhouse gas emissions for agencies such that they may follow appropriate standards on calculating GHG emissions from projects, determine potential significance, and implement mitigation measures if necessary and feasible. Finally, Executive Order S-3-05, issued by Governor Schwarzenegger, reinforces these goals and sets a schedule for the reporting of both the measured impacts of climate change upon California's natural environment and the emissions reduction efforts undertaken by a myriad of state, regional, and local groups. Executive Order S-3-05 establishes an additional target of 80% below 1990 levels by 2050.

ICLEI Local Governments for Sustainability Climate Mitigation Program

ICLEI – Local Governments for Sustainability (herewith known as "ICLEI") is an association for local governments to share knowledge and successful strategies toward increasing local sustainability.[3] ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones (shown in Figure 2 below):

1. Conduct an inventory and forecast of local greenhouse gas emissions
2. Establish a greenhouse gas emissions reduction target
3. Develop a climate action plan for achieving the emissions reduction target

[3] ICLEI was formerly known as the International Council for Local Environmental Initiatives, but the name has been changed to ICLEI – Local Governments for Sustainability. http://www.iclei.org & http://www.icleiusa.org

4. Implement the climate action plan
5. Monitor and report on progress

This report represents the completion of ICLEI's Climate Mitigation Milestone One and provides a foundation for future work to reduce greenhouse gas emissions in the City of Auburn.

Figure 2: The Five Milestones of identifying and reducing greenhouse gas

Pacific Gas and Electric-Sponsored Inventory Project

This project was made possible by the Pacific Gas and Electric Company (PG&E) Green Communities Program with funding from California utility customers under the auspices of the California Public Utilities Commission. The Green Communities Program assists local governments by providing easy-to-understand information, technical expertise, and financial resources to support local climate action planning. The Green Communities Program is designed to help local governments and communities achieve greenhouse gas reduction goals and to improve air quality, reduce energy costs, and curb greenhouse gas emissions.

Inventory Methodology

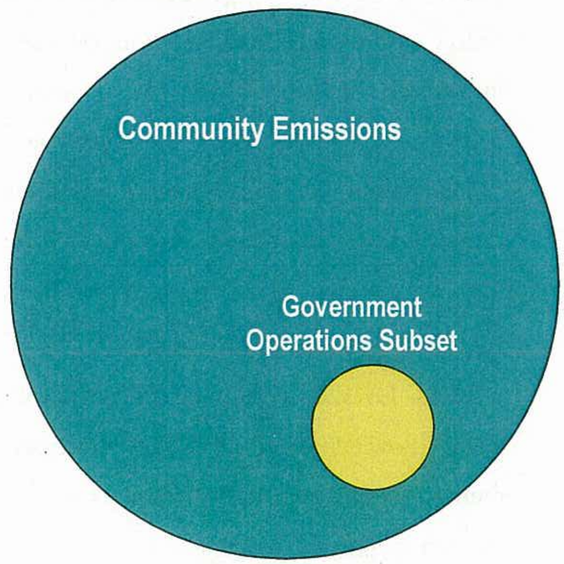


Figure 3: The Government Operations Emissions Inventory as a subset of the Community Emissions Inventory.

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline levels and sources of emissions in the community. As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. Standard processes of accounting for emissions have been developed to which our inventory adheres. SBC staff used the International Local Government GHG Emissions Analysis Protocol (IEAP) to inventory the city's community emissions. In addition, methods from the Local Government Operations Protocol were used as appropriate for specific sectors.

The City of Auburn has previously completed an inventory of emissions from government operations. The government operations inventory is a subset of the community inventory; for example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles. The government operations inventory is in this way a subset of the community-scale inventory, as shown in Figure 3.

Community Emissions Protocol

The IEAP, developed by ICLEI, provides guidelines for local governments in quantifying greenhouse gas emissions from the community within their geopolitical boundaries. Staff used this protocol to inventory the City of Auburn's community emissions. ICLEI began development of the IEAP with the inception of its Cities for Climate Protection Campaign in 1993, and through this work has established a common GHG emissions inventory protocol for all local governments worldwide.[4] ICLEI USA is currently developing a Community Protocol supplement for the US which is similar in many respects to the Local Government Operations Protocol (LGO Protocol) described below.

Local Government Operations Protocol

In 2008, ICLEI, the California Air Resources Board (CARB), and the California Climate Action Registry (CCAR) released the LGO Protocol to serve as a national appendix to the IEAP.[5] The LGO Protocol serves as the national standard for quantifying and reporting greenhouse gas emissions from local government operations. The purpose of the LGO Protocol is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory. The LGO Protocols also informs some methods used for community inventories.

Quantifying Greenhouse Gas Emissions

Establishing a Base Year

The inventory process requires the selection of a base year with which to compare current emissions. The City of Auburn's community greenhouse gas emissions inventory utilized 2005 as its base year. 2005 is a commonly accepted baseline year in California – it is the reference year in both SB 375 and Executive Order S-3-05. In addition, 2005 is one of the earliest years for which relatively comprehensive data is available and is the base year used in the City of Auburn's government-operations inventory.

Establishing Boundaries

Setting an organizational boundary for greenhouse gas emissions accounting and reporting is an important step in the inventory process. The City of Auburn's community inventory assessed emissions resulting from activities within its

[4] International Local Government Greenhouse Gas Emissions Analysis Protocol (IEAP). ICLEI. http://www.iclei.org/index.php?id=ghgprotocol
[5] Local Government Operations Protocol (LGOP). http://www.icleiusa.org/programs/climate/ghg-protocol/ghg-protocol

geopolitical boundary. The IEAP defines geopolitical boundary as that "consisting of the physical area or region over which the local government has jurisdictional authority." Activities that occur within this boundary can be, for the most part, controlled or influenced by the City of Auburn's policies and educational programs. Although the city may have limited influence over the level of emissions from some activities, it is important that every effort be made to compile a complete analysis of all activities that resulted in greenhouse gas emissions. A government facility operated by another jurisdiction but located within the City of Auburn's jurisdictional boundary would be included in the community inventory.

Emission Types

The IEAP and LGOP recommend assessing emissions from the six internationally recognized greenhouse gases regulated under the Kyoto Protocol as listed in Table 1. Emissions of Hydrofluorocarbons, Perfluorocarbons, and Sulfur Hexafluoride were not included in this inventory because of the difficulty in obtaining data on these emissions at a community scale. Greenhouse gas emissions are commonly aggregated and reported in terms of equivalent carbon dioxide units, or CO_2e. This standard is based on the Global Warming Potential (GWP) of each gas, which is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its warming effect, so one metric ton of methane emission is equal to twenty-one metric tons of carbon dioxide equivalents. See Table 1 for the GWPs of the commonly occurring greenhouse gases.

Table 1: Greenhouse Gases

Greenhouse Gas	Chemical Formula	Global Warming Potential
Carbon Dioxide	CO_2	1
Methane	CH_4	21
Nitrous Oxide	N_2O	310
Hydrofluorocarbons	Various	43-11,700
Perfluorocarbons	Various	6,500-9,000
Sulfur Hexafluoride	SF_6	23,900

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

- **Measurement-based** methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- **Calculation-based** methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used: *Activity Data x Emission Factor = Emissions*

All emissions sources in this inventory were quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see appendices for a detailed listing of the activity data used in composing this inventory.

Known emission factors were used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO_2/kWh of electricity). Table 2 demonstrates examples of common emission calculations that use this formula. Please see appendices for details on the emissions factors used in this inventory.

Table 2: Basic Emissions Calculations

Activity Data	Emissions Factor	Emissions
Electricity Consumption (kWh)	**CO2 emitted/kWh**	**CO2 emitted**
Natural Gas Consumption (therms)	**CO2 emitted/therm**	**CO2 emitted**
Gasoline/Diesel Consumption (gallons)	**CO2 emitted /gallon**	**CO2 emitted**
Vehicle Miles Traveled	**CH4, N2O emitted/mile**	**CH4, N20 emitted**

CACP 2009 Software

To facilitate community efforts to measure greenhouse gas emissions as a first step towards reducing them, ICLEI developed the Clean Air and Climate Protection 2009 (CACP 2009) software package in partnership with the National Association of Clean Air Agencies (NACAA) and the U.S. Environmental Protection Agency (EPA). CACP 2009 is designed for compatibility with the LGO Protocol and determines emissions by combining activity data (energy consumption, waste generation, etc.) with verified emission factors.

The CACP software has been and continues to be used by over 600 U.S. local governments to measure their greenhouse gas emissions. However, it is worth noting that although the software provides governments with a sophisticated and useful tool, calculating emissions from activity data with precision is difficult. The model depends upon numerous assumptions and is limited by the quantity as well as quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation of reality rather than an exact value.

Evaluating Emissions

There are several important concepts involved in the analysis of emissions arising from many different sources and chemical/mechanical processes throughout the community. Those not already touched on are explored below.

Emissions by Scope

For both community and government operations, emissions sources were categorized relative to the geopolitical boundary of the community or the operational boundaries of the government. Additionally, emissions sources were categorized as either Scope 1, Scope 2, or Scope 3. The Scopes framework is used to prevent double counting of emissions for major categories such as electricity use and waste disposal.

The Scopes framework identifies three emissions scopes for community emissions:

- **Scope 1:** All direct emissions from sources located within the geopolitical boundary of the local government.
- **Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within the geopolitical boundary of the local government, but that rely upon emissions-producing processes located outside of the government's jurisdiction.
- **Scope 3:** All other indirect or embodied emissions not covered in Scope 2 that occurred as a result of activity within the geopolitical boundary.

Scope 1 and Scope 2 sources are the most essential components of a community greenhouse gas analysis as these sources are typically the most significant in scale and are most easily affected by local policy making. In addition to the categories in the Scopes framework, emission sources may also fall in a fourth category called Information Items.

Information Items

Information items are emissions sources that are not included as Scope 1, 2, or 3 emissions in the inventory, but are reported here separately in order to provide a more complete picture of emissions from the City of Auburn's government operations.

A common emission that is categorized as an information item is carbon dioxide emitted in the combustion of biogenic fuels. Local governments or utilities will often burn fuels that are of biogenic origin (wood, landfill gas, organic solid waste, biofuels, etc.) to generate power. In the City of Auburn some homes burn wood to heat their homes. Other common sources of biogenic emissions are the combustion of landfill gas from landfills or biogas from wastewater treatment plants, as well as the incineration of organic municipal solid waste at incinerators.

Carbon dioxide emissions from the combustion of biogenic fuels are not included in Scope 1 based on established international principles. Methane and nitrous oxide emissions from biogenic fuels are considered Scope 1 stationary combustion emissions and are included in the stationary combustion sections for the appropriate facilities. These principles indicate that biogenic fuels (e.g., wood, biodiesel), if left to decompose in the natural environment, would release CO_2 into the atmosphere, where it would then enter back into the natural carbon cycle. Therefore, when wood or another biogenic fuel is combusted, the resulting CO_2 emissions are akin to natural emissions and should therefore not be considered as human activity-generated emissions. The CH_4 and N_2O emissions, however, would not have occurred naturally and are therefore included as Scope 1 emissions.

Emissions by Sector

In addition to categorizing emissions by scope, this inventory examines emissions by sector. Many local governments find a sector-based analysis more relevant to policy making and project management, as it assists in formulating sector-specific reduction measures and climate action plan components. Table 3 shows the sectors that are included in this inventory:

Table 3: Community Sectors

Community Sectors
Residential
Commercial / Industrial
Transportation
Solid Waste and Wastewater

Community Emissions Inventory Results

Emissions by Scope

The emissions sources by scope and sector included in this inventory are listed in Table 4.

Table 4: Scopes and Sectors Included in the City of Auburn's Community Inventory

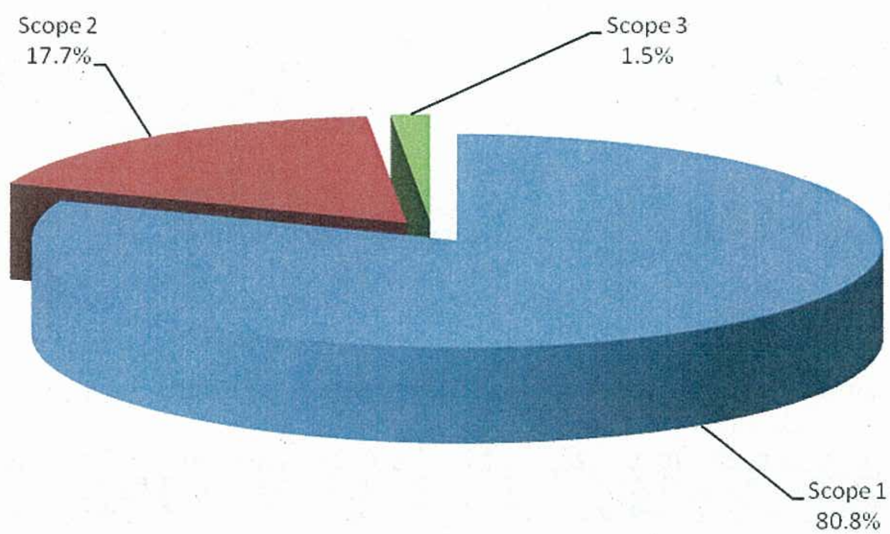
Sector	Scope 1	Scope 2	Scope 3	Information Items
Residential	**Natural Gas, Propane, Fuel Oil, Wood**	**Electricity**		**Biogenic Emissions from Wood Combustion**
Commercial / Industrial	**Natural Gas, Propane and Diesel Fuel**	**Electricity**		
Transportation	**Gasoline & Diesel**			
Solid Waste and Wastewater	**Auburn Sanitary Landfill, Wastewater Treatment**		**Future Emissions from 2005 Waste**	

Total roll-up community emissions for the City of Auburn were approximately 175,448 metric tons[6] of CO_2e in the year 2005. This roll-up does not include emissions categorized as information items. Because the sources that go into a roll-up number vary from community to community, this number should not be used for comparison purposes without a careful analysis of the basis of the number. Table 5 and Figure 4 present the emissions calculations by scope and sector.

Table 5: Community GHG Emissions per Sector per Scope (metric tons CO_2e)

Sector	Scope 1	Scope 2	Scope 3	TOTAL	Information Items
Residential	15,125	10,274	0	25,399	620
Commercial / Industrial	6,006	20,810	0	26,816	0
Transportation	115,505	0	0	115,505	0
Solid Waste and Wastewater	5,085	0	2,642	7,727	0
TOTAL	141,721	31,084	2,642	175,448	620
% of Total CO_2e	80.8%	17.7%	1.5%	100.0%	

Figure 4: Community GHG Emissions by Scope



The following sections describe each of the individual scopes in more detail. As shown in Table 6 and Figure 5 below, the largest percentage of Scope 1 emissions came from the Transportation sector. Diesel and gasoline use within Auburn's city limits on local roads, state highways, and by off-road vehicles (Transportation sector) constituted 81.5% of Scope 1 emissions. The remainder of Scope 1 emissions came from stationary fuel combustion (combustion of natural gas, propane, heating oil, and wood.) in the City of Auburn's homes (Residential sector, 10.7%), stationary fuel

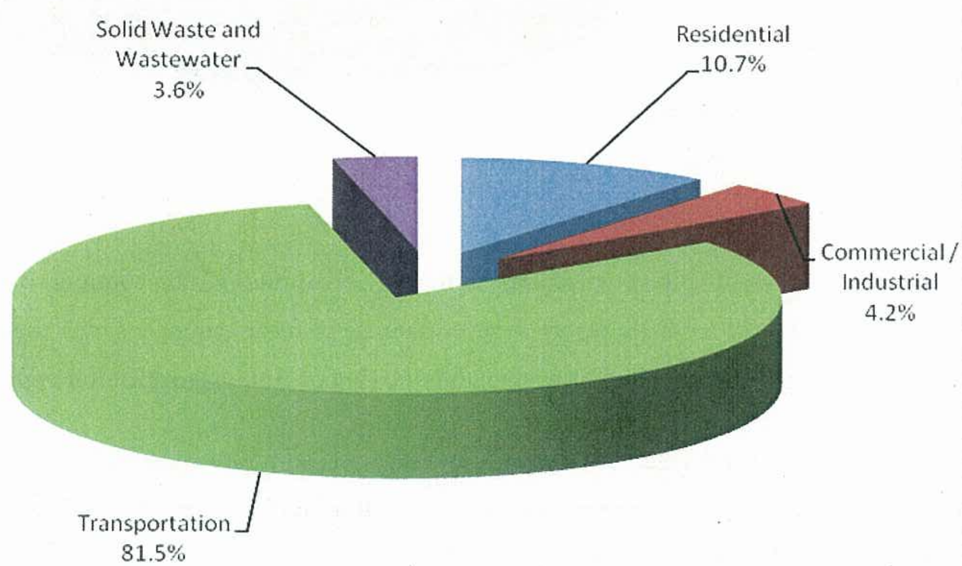
[6] All emissions estimated using ICLEI's CACP 2009 Software.

combustion in businesses/industry (Commercial/Industrial sector, 4.2%), and fugitive emissions from wastewater treatment and the Auburn Sanitary Landfill (Solid Waste and Wastewater Sector, 3.6%).

Table 6: Community Scope 1 GHG Emissions (metric tons CO_2e)

Scope 1 Emissions By Sector	Residential	Commercial / Industrial	Transportation	Solid Waste and Wastewater	TOTAL
CO2e (metric tons)	15,125	6,006	115,505	5,085	141,721
% of Total CO_2e	10.7%	4.2%	81.5%	3.6%	100.0%
MMBtu	288,623	112,889	1,581,280	0	1,982,792

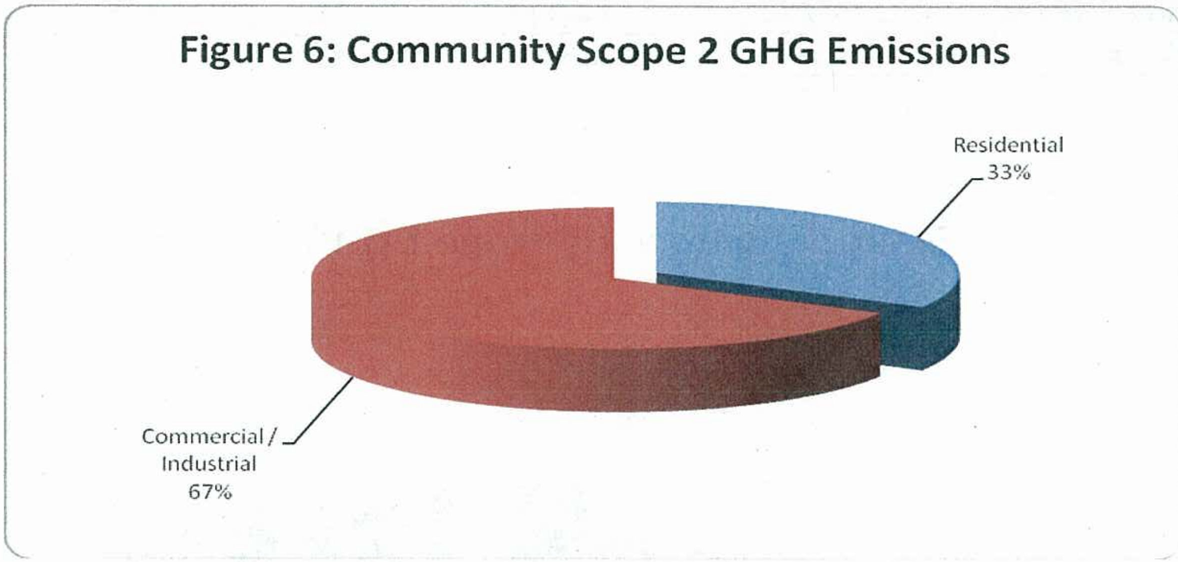
Figure 5: Community Scope 1 GHG Emissions



As shown in Table 7 and Figure 6, 67% of 2005 Scope 2 emissions were generated by the Commercial/Industrial sector. Thirty-three percent of the City of Auburn's Scope 2 emissions came from electricity consumption by the Residential sector within city boundaries. As noted above in the general description of Scope 2 parameters, the actual emissions from these activities were generated outside of the City of Auburn's boundaries—in this case, at the source of electricity generation.

Table 7: Community Scope 2 GHG Emissions (metric tons CO_2e)

Scope 2 Emissions By Sector	Residential	Commercial / Industrial	TOTAL
CO2e (metric tons)	10,274	20,810	31,084
% of Total CO_2e	33%	67%	100%
MMBtu	156,540	254,415	410,956



The remaining portion of emissions included in the City of Auburn's 2005 community inventory fell under the category of Scope 3. All emissions in this category were an estimate of future emissions over the lifecycle decomposition of waste and alternative daily cover (ADC) sent from within the City of Auburn to a landfill in the base year (2005).[7]

In addition to Scope 1, Scope 2, and Scope 3 emissions, there were emissions of 620 metric tons CO_2e as information items. These emissions came from wood burned as a heating fuel in the City of Auburn's homes. Information items were not included in any inventory roll-up numbers.

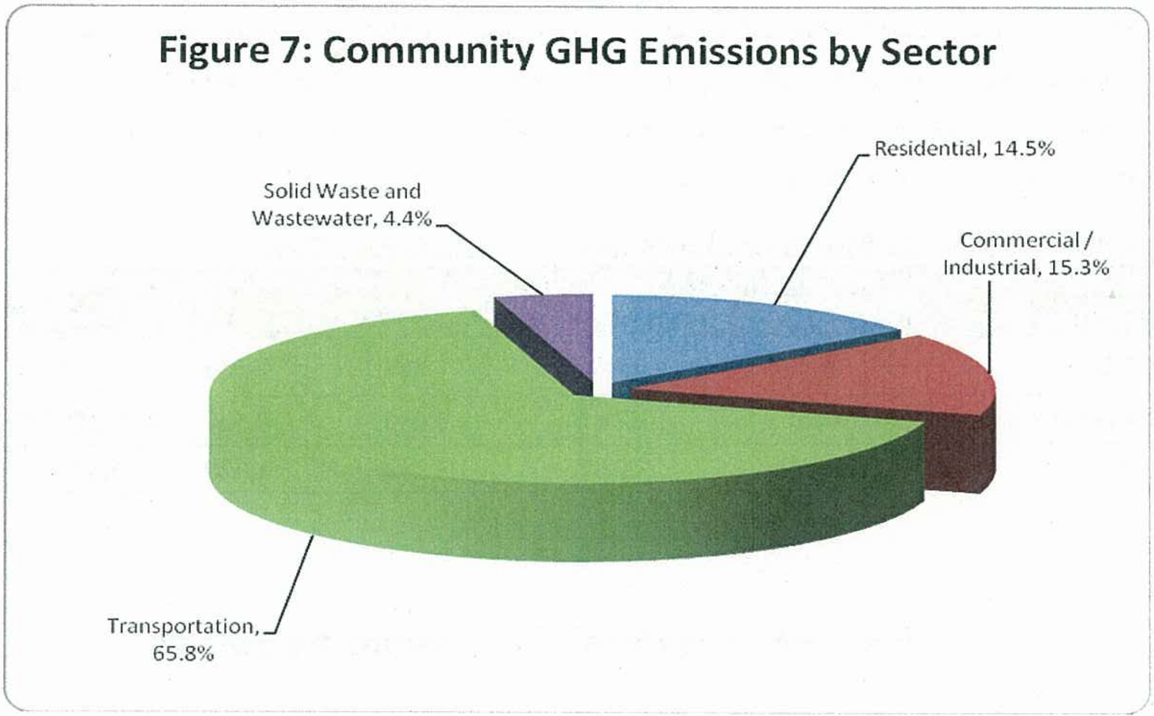
Emissions by Sector

In addition to considering emissions via scopes, we can also focus specifically on each sector, with emissions aggregated by sector. As visible in Table 8 and Figure 7 below, emissions from the Transportation sector (same gasoline and diesel sources as that listed under Scope 1 above) were by far the largest source of community emissions (65.8%). Electricity, natural gas, propane, and diesel consumption within the Commercial/Industrial sector accounted for 15.3% of total community emissions while electricity, natural gas, and stationary fuel usage within the Residential sector caused 14.5% of the City of Auburn's overall emissions. The remaining 4.4% came from the Waste sector. See below for further detail on each sector.

[7] The Solid Waste and Wastewater section of this report presents more detail on emissions from solid waste.

Table 8: Community GHG Emissions by Sector (metric tons CO_2e)

Community Emissions by Sector	Residential	Commercial / Industrial	Transportation	Solid Waste and Wastewater	TOTAL
CO2e (metric tons)	25,399	26,816	115,505	7,727	175,448
% of Total CO_2e	14.5%	15.3%	65.8%	4.4%	100.0%
MMBtu	445,163	367,304	1,581,280	0	2,393,748



Residential

As shown in Table 8, the City of Auburn's Residential sector generated an estimated 25,399 metric tons of CO_2e in 2005. This estimate was calculated using 2005 electricity and natural gas consumption data provided by PG&E and estimates of home heating fuel use based on census and weather data. It only includes consumption through residential buildings. Data on fuel use from residential emergency generators was not available, and was not included in this inventory. Data on residential equipment usage, such as lawnmowers, were included in the Transportation Sector. GHG emissions associated with residential transportation and residential waste generation were included separately in the Transportation and Waste Sector emissions totals, respectively. Appendix B provides detailed Residential sector emissions methods.

Table 9 provides information on residential emissions on a per household basis. The City of Auburn households generated 25,399 metric tons of GHG emissions in 2005. Per household emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one's emissions with neighboring cities and against regional and national averages. That said, when comparing figures, be aware that due to differences in emission inventory methods it can be difficult to get a directly comparable per-household emissions number.

Table 9: The City of Auburn 2005 Greenhouse Gas Emissions per Household

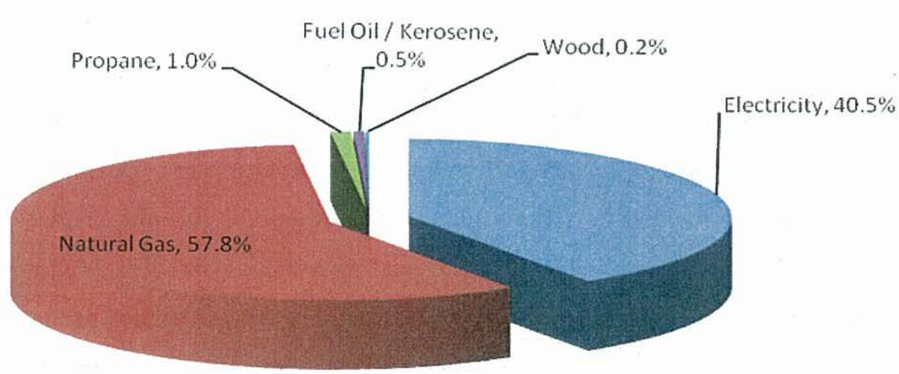
Number of Occupied Housing Units	**5,649**
Total Residential GHG Emissions (metric tons CO2e)	**25,399**
Residential GHG Emissions/Household (metric tons CO2e)	**4.5**

Table 10 and Figure 8 illustrate the breakdown of residential GHG emissions by fuel type. An estimated 57.8% of residential GHG emissions were generated from the use of natural gas. Natural gas is typically used in residences as a fuel for home heating, water heating, and cooking. Approximately 40.5% of residential GHG emissions were generated through electricity provided by PG&E. Propane and fuel oil, also used for home heating and water heating, generated 1.0% and 0.5% of residential GHG emissions respectively. Finally, wood used for home heating accounted for 0.2% of residential emissions (excluding biogenic CO_2 emissions).

Table 10: Residential Emissions by Source (metric tons CO_2e)

Residential Emission Sources 2005	Electricity	Natural Gas	Propane	Fuel Oil / Kerosene	Wood	TOTAL
MTCO2e	**10,274**	**14,672**	**264**	**136**	**52**	**25,399**
% of Total CO_2e	**40.5%**	**57.8%**	**1.0%**	**0.5%**	**0.2%**	**100.0%**
MMBtu	**156,540**	**276,025**	**4,162**	**1,829**	**6,607**	**445,163**

Figure 8: Residential Emissions by Source



Commercial / Industrial

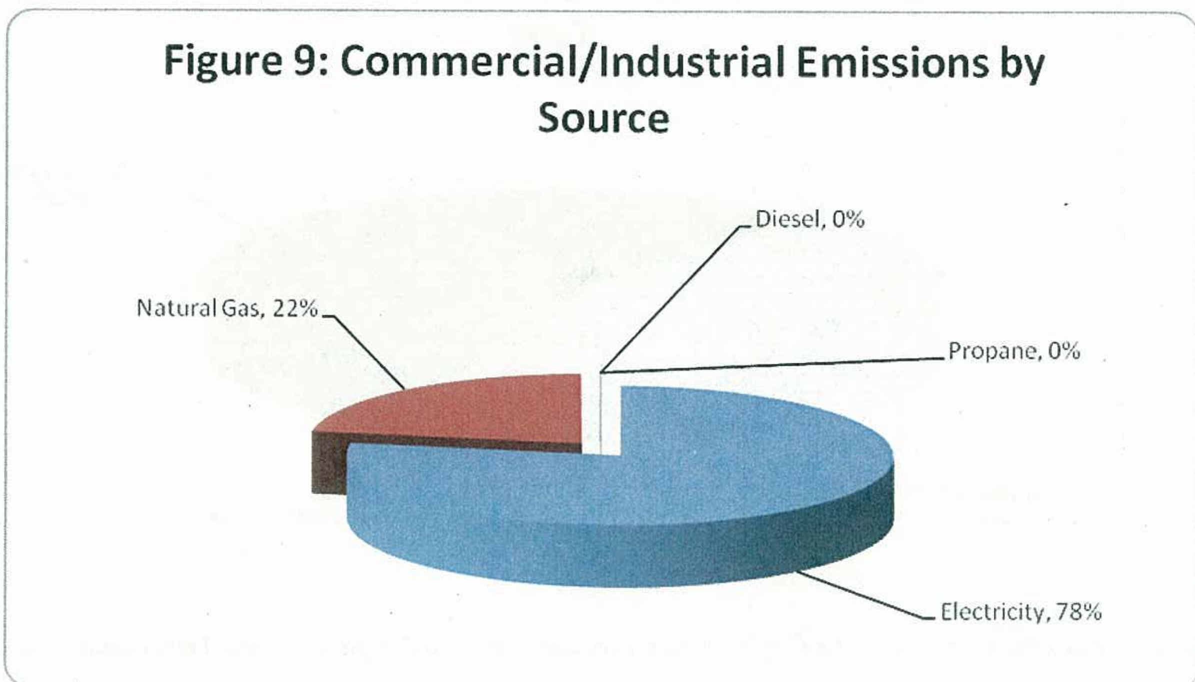
As mentioned previously, the City of Auburn's businesses and industries generated nearly 15% of community-wide GHG emissions in 2005, or 26,816 metric tons of CO_2e.

In addition to emissions from natural gas and electricity consumption, there were additional Commercial/Industrial sector stationary combustion emissions included in this inventory.[8] This data was provided by the Placer Air Pollution Control District and includes CO_2, CH_4, and N_2O emissions from several emergency generators that use propane and diesel fuel. Stationary combustion emissions associated with Commercial/Industrial natural gas use were intentionally excluded from the Placer Air Pollution Control District data, assuming that the majority of natural gas-associated emissions were accounted for using Utility and CEC data. Appendix C provides details on Commercial/Industrial emissions methods.

As illustrated in Table 11 and Figure 9, 22% of emissions were generated from the combustion of natural gas, used for space heating as well as on-site generation of electricity and the operation of boilers. Commercial/Industrial electricity consumption accounted for the remaining 78% of the Commercial/Industrial greenhouse gas emissions. Note that the calculated emissions associated with the burning of propane and diesel fuel was very small.

Table 11: Commercial/Industrial Emissions by Source (metric tons CO_2e)

Commercial / Industrial Emission Sources 2005	Electricity	Natural Gas	Propane	Diesel	TOTAL
CO2e (metric tons)	20,810	5,988	0.1	17.2	26,816
% of Total CO_2e	78%	22%	0%	0%	100%
MMBtu	254,415	112,656	1	232	367,304



[8] Stationary combustion emissions are those generated from on-site stationary commercial and industrial equipment including power plants and emergency generators.

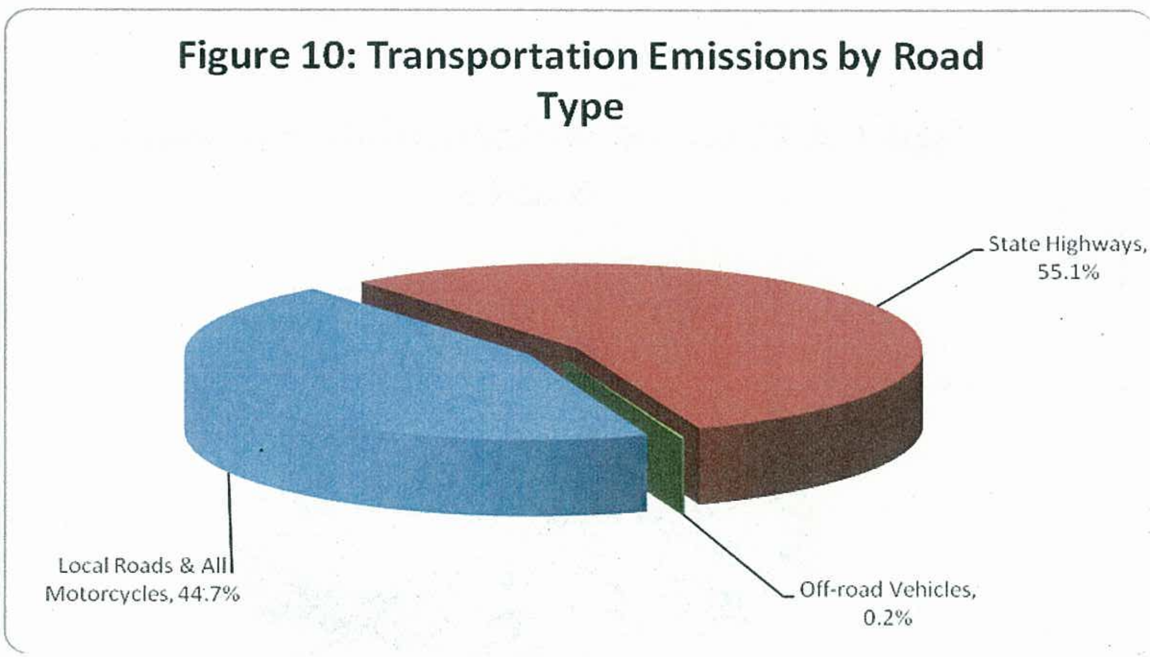
Transportation

As shown previously in Figure 7 and Table 8, the City of Auburn's Transportation sector accounted for 115,505 metric tons CO_2e, or 66%, of the city's 2005 GHG emissions. The Transportation sector analysis included emissions from all vehicle use within the City of Auburn's boundaries (whether on local roads or state highways passing through their jurisdiction), including off-road vehicles and machines. [9]

Figure 10 and Table 12, show that 55.1% of the City of Auburn's 2005 transportation-related greenhouse gas emissions were generated from vehicle miles traveled (VMT) on state highways located within city boundaries, while 44.7% were generated from vehicles on local roads and from motorcycles. Off-road vehicles generated the remaining 0.2% percent of transportation-related greenhouse gas emissions.

Table 12: Transportation Emissions by Road Type (metric tons CO_2e)

Transportation Road Type Emissions Sources 2005	Local Roads & All Motorcycles	State Highways	Off-road Vehicles	TOTAL
CO2e (metric tons)	51,663	63,655	187	115,505
% of Total CO_2e	44.7%	55.1%	0.2%	100.0%
MMBtu	707,472	873,808	data not available	1,581,280



Emissions from the air travel of the City of Auburn residents were not included in the Transportation sector analysis. With more time and the availability of additional data the greenhouse gas emissions from air travel could be estimated. Because there were no *major* airports located within the geographic boundaries of the City of Auburn it is reasonable to

[9] See Appendix D for further information on Transportation Sector methods.

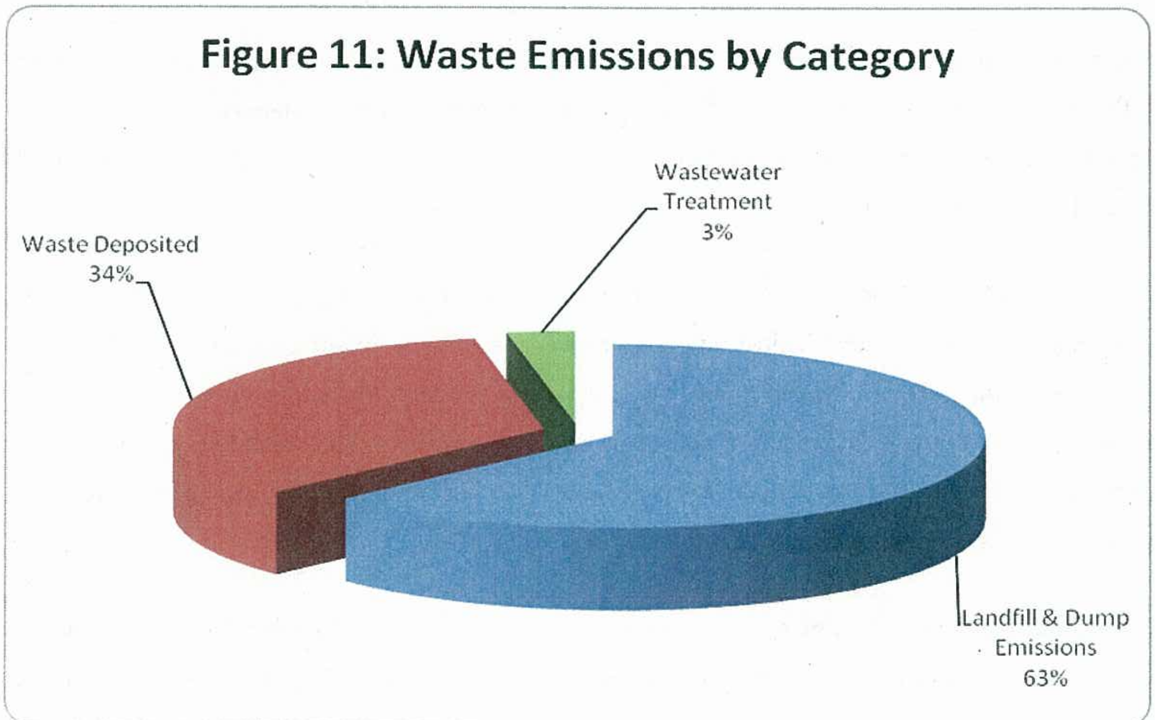
exclude air travel from this inventory. However, the emissions from operations at the *municipal* airport were accounted for. Please see Appendix D for more detail on methods used in calculating emissions from the Transportation sector.

Solid Waste and Wastewater

As noted above in Figure 7 and Table 8, the Solid Waste and Wastewater sector constituted 4.4% of total 2005 emissions for the community of the City of Auburn, or 7,727metric tons CO_2e. Table 13 and Figure 11 detail Solid Waste and Wastewater emissions by category.

Table 13: Solid Waste and Wastewater Emissions by Category (metric tons CO_2e)

Waste Emissions Categories 2005	Landfill & Dump Emissions	Waste Deposited	Wastewater Treatment	TOTAL
CO2e (metric tons)	4,855	2,642	231	7,727
% of Total CO_2e	63%	34%	3%	100%



Solid Waste emissions are an estimate of methane generation from the anaerobic decomposition of organic wastes (such as paper, food scraps, plant debris, wood, etc.) that are deposited in a landfill. This inventory accounted for 2005 Scope 1 fugitive emissions from the Auburn Sanitary Landfill within the jurisdiction, as well as Scope 3 future emissions associated with all solid waste generated in 2005 within the community[10]:

[10] See Appendix E for more information on methods and emissions factors used in the Solid Waste Sector analysis.

- ***Landfill Emissions (Scope 1):*** Total emissions from the Auburn Sanitary Landfill in 2005. These emissions were the result of decomposing organic waste still in-place in the landfill in Auburn.[11] Specifically, included in the inventory were estimated fugitive emissions (emissions not captured by any methane recovery) coming off the landfill in 2005.
- ***Waste Generation (Scope 3):*** Emissions from waste generated within the City of Auburn in 2005 and from alternative daily cover (ADC) sent to landfills. These emissions were the estimated future emissions of 2005-generated waste or ADC that was sent to any landfill by the City of Auburn's residents or businesses. These emissions were categorized as Scope 3 because they are not emitted in the base year, but will result from the decomposition of the 2005 waste over the full 100+ year cycle of its decomposition.

The Scope 3 waste emissions method is relevant to policy development addressing waste diversion, while the Scope 1 method is most relevant to landfill gas management practices. Therefore both pieces of information are policy-relevant. Transportation emissions generated from the collection, transfer and disposal of solid waste were included in Transportation Sector GHG emissions.

Wastewater emissions are an estimate of fugitive N_2O and CH_4 emissions (Scope 1) from wastewater treatment plants (WWTPs), wastewater treatment facilities (WWTFs), and decentralized septic systems in 2005. Emissions from the City of Auburn's treatment of wastewater constituted 3% of total Waste sector emissions, the result of both the Auburn WWTP and decentralized septic.

The wastewater emissions from centralized WWTPs were the result of two processes: nitrification/denitrification and anaerobic digestion. Nitrification/denitrification is a process that can be employed at a treatment facility to reduce total Nitrogen levels within influent. Municipalities that choose this process only reduce the eventual levels of N_2O, they do not eliminate them. Anaerobic digestion of collected sludge contributed to CH_4 emissions through the decomposition of organic material. Note that these emissions were the result of incomplete combustion of captured CH_4; capture and flaring of CH_4 gas is a necessary part of digester systems.

Emissions from decentralized septic treatment were the result of anaerobic digestion through the use of baffled holding tanks, emitting primarily CH_4. Emissions from this process were the result of fugitive emissions from the tank itself (if there is an exhaust vent) and from the surrounding soil, in which the leechate is finally deposited[12].

Agriculture

Land use analysis showed that in comparison to the county as a whole, the limited agriculture land within the City of Auburn's jurisdiction was deemed to be insignificant. As a result, emissions resulting from agricultural activity (livestock enteric fermentation, livestock manure management and fertilizer application) were assumed to be de minimis in this

[11] It can take over 100 years for a given quantity of waste to fully decompose in a landfill, releasing methane and other gases as it breaks down. As such, base year landfill emissions are the result of many years of waste disposal.

[12] See Appendix F for more information on methods and emissions factors used in the Wastewater Sector analysis.

inventory and all emissions attributed to the county. The emissions associated with energy consumption and transportation in the agricultural sector were reflected in the industrial and transportation emission totals respectively.

Per Capita Emissions

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities as well as against regional or national averages. That said, due to differences in emission inventory methods, it can be difficult to get a directly comparable per capita emissions number; one must be cognizant of this margin of error when comparing figures.

Community GHG Scope 1, 2 and 3 roll-up emission numbers arise from residential and business sectors, transportation, solid waste generation and wastewater treatment. Table 14 divides this roll-up number by population to yield a result of 13.5 metric tons of CO_2e per capita. This compares to the California per capita of 13.0 tonnes per year CO_2e emissions and the United States per capita of 24.3 tonnes per year CO_2e emissions. It is important to understand that this number is not the same as the carbon footprint of the average individual living in the City of Auburn (which would include emissions from production of goods purchased from outside the community, emissions resulting from air travel, etc.).

Table 14: The City of Auburn 2005 Greenhouse Gas Emissions per Capita

Estimated 2005 Population	**12,971**
Community GHG Emissions (metric tons CO_2e)	**175,448**
GHG Emissions / Resident (metric tons CO_2e)	**13.5**

Conclusion & Next Steps

This analysis found that 175448 metric tons of CO_2e were emitted from within the city limits of the City of Auburn in the base year 2005, with emissions from the Transportation sector contributing the most to this total. (See summary table in Appendix A for more detail.)

Based on the ICLEI methodology and recommendations, the City of Auburn should begin to document emissions reduction measures that have been implemented since 2005 and quantify the emissions benefits of these measures to demonstrate progress made to date.

If the City of Auburn chooses to consider pursuing emission reduction strategies ICLEI recommends that the City create a local climate action plan, which would identify and quantify the emission reduction benefits of climate and sustainability strategies that could be implemented in the future, such as: energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction, and other strategies. Through these efforts and others the City of Auburn can achieve additional benefits beyond reducing emissions, including saving money and improving the City of Auburn's economic vitality and its quality of life. City staff should continue to update this inventory as additional data become available.

Setting Emissions Reduction Targets

This inventory provides an emissions baseline that can be used to inform Milestone Two of ICLEI's Five-Milestone process—setting emissions reduction targets for the City of Auburn's community activities. The greenhouse gas emissions reduction target is a goal to reduce emissions to a certain percentage below base year levels by a chosen planning horizon year. An example target might be a 30% reduction in emissions below 2005 levels by 2020. A target provides an objective toward which to strive and against which to measure progress. It allows a local government to quantify its commitment to fighting climate change—demonstrating that the jurisdiction is serious about its commitment and systematic in its approach.

In selecting a target, it is important to strike a balance between scientific necessity, ambition, and what is realistically achievable. The City of Auburn should give itself enough time to implement chosen emissions reduction measures—noting that the farther out the target year is, the more the City of Auburn should pledge to reduce. ICLEI recommends that regardless of the chosen long-term emissions reduction target (e.g., 15-year, 40-year), the City of Auburn should establish linear interim targets for every two- to three-year period. Near-term targets facilitate additional support and accountability, and linear goals help to ensure continued momentum around local climate protection efforts. To monitor the effectiveness of its programs, the City of Auburn should plan to re-inventory its emissions on a regular basis; many jurisdictions are electing to perform annual inventories. ICLEI recommends conducting an emissions inventory every three to five years.

The Long-Term Goal

ICLEI recommends that near-term climate work should be guided by the long-term goal of reducing its emissions by 80% or more from the 2005 baseline level by the year 2050 (California Global Warming Solutions Act of 2006). By referencing a long-term goal that is in accordance with current scientific understanding, the City of Auburn can demonstrate that it intends to do its part towards addressing greenhouse gas emissions from its community activities.

It is important to keep in mind that it will be next to impossible for local governments to reduce emissions by 80 to 95% without the assistance of state and federal policy changes that create new incentives and new sources of funding for emissions reduction projects and programs. However, in the next 15 years, there is much that local governments can do to reduce emissions independently. It is also important that the City of Auburn works to reduce its emissions sooner, rather than later: the sooner a stable level of greenhouse gases in the atmosphere is achieved, the less likely it is that some of the most dire climate change scenarios will be realized. Additionally, cost saving projects can be undertaken now – why wait to increase the quality of community activities, while reducing taxpayer costs?

State of California Targets and Guidance

An integral component of the State of California's climate protection approach has been the creation of three core emissions reduction targets at the community level. On June 1, 2005 California Governor Schwarzenegger signed Executive Order S-3-05 establishing climate change emission reductions targets for the State of California. The California targets are an example of near-, mid-, and long-term targets:

- Reduce emissions to 2000 levels by 2010
- Reduce emissions to 1990 levels by 2020
- Reduce emissions to 80 percent below 1990 levels by 2050

The AB 32 Scoping Plan also encourages local governments to establish targets; specifically the Plan suggests creating an emissions reduction goal of 15% below "current" levels by 2020. This target has informed many local government's emission reduction targets for community activities—most local governments in California with adopted targets have targets of 15 to 25% reductions under 2005 levels by 2020.

Creating an Emissions Reduction Strategy

This inventory identifies the major sources of emissions from the City of Auburn's community activities and, therefore, where policymakers may want to focus their efforts to target emission reduction activities if they are to make significant progress toward adopted targets, and potentially large cost savings. For example, since the Commercial/Industrial sector was a major source of emissions from the City of Auburn's community activities, it is possible that the City of Auburn could meet near-term targets by implementing a few major actions, decided on by the City, to reduce building energy use related emissions in this sector. Medium-term targets could be met by focusing emission reduction actions on the Residential and Transportation sectors, and the long term (2050) target will not be achievable without significant reductions in all sectors.

Please note that, whenever possible, reduction strategies should include cost-saving projects that both reduce costs (such as energy bills) while reducing greenhouse gas emissions. These "low hanging fruit" are important because they frequently represent win-win situations in which there is no downside to implementation. Selecting these projects in the order of largest to smallest benefit ensures that solid, predictable returns can be realized locally. These projects lower recurring expenditures, save taxpayer dollars, create local jobs, and benefit the community's environment.

Given the results of the inventory, ICLEI recommends that the City of Auburn focus on the following tasks in order to significantly reduce emissions from its community activities:

- Implement Travel Demand Management
- Promote Ride Sharing
- Develop Renewable Energy Programs
- Reduce Energy Use

- Implement Carbon-Credit Programs
- Expand Recycling Efforts
- Encourage LEED Certified Construction
- Participate in Phase III of Green Communities: Develop a local Climate Action Plan

The above strategies would become more detailed and unique through the development of a climate action plan. Using these strategies as a basis for a more detailed overall emissions reduction strategy, or climate action plan, the City of Auburn should be able to reduce its impact on global warming. In the process, it may also be able to improve the quality of its services, reduce costs, stimulate local economic development, and inspire local residents and businesses to redouble their own efforts to combat climate change.

Project Resources

ICLEI has created tools for the City of Auburn to use to assist with future monitoring inventories. These tools are designed to work in conjunction with the IEAP, which is the primary reference document for conducting an emissions inventory. The following tools should be saved as resources and supplemental information to this report:

- The "Master Data Workbook" that contains most or all of the raw data (including emails), data sources, emissions, notes on inclusions and exclusions, and reporting tools
- The "Data Gathering Instructions" on the types of emissions and data collection methodology for each inventory sector

Appendices

Appendix A - Detailed Community Greenhouse Gas Emissions in 2005

Sector	Emissions Source	Equiv CO_2 (metric tons)	Equiv CO_2 (%)	Energy (MMBtu)	Data Source
Residential					
	Electricity	10,274	5.6%	156,540	PG&E
	Natural Gas	14,672	8.1%	276,025	PG&E
	Propane	264	0.1%	4,162	Census Estimates
	Fuel Oil/Kerosene	136	0.1%	1,829	Census Estimates
	Wood	52	0.03%	6,607	Census Estimates
Subtotal Residential		**25,399**	**14%**	**445,163**	
Commercial/Industrial					
	Electricity	20,810	12%	254,415	PG&E
	Natural Gas	5,988	3%	112,656	PG&E
	Propane	0.1	0%	0.9	Placer Air Pollution Control District
	Diesel	17.2	0%	232	Placer Air Pollution Control District
Subtotal Commercial		**26,816**	**15%**	**367,304**	
Transportation					
Local Roads AVMT	Gasoline	28,397	17%	394,814	Caltrans/CARB
	Diesel	23,141	13%	312,657	Caltrans/CARB
State Highways AVMT	Gasoline	35,074	20%	487,641	Caltrans/CARB
	Diesel	28,582	17%	386,167	Caltrans/CARB
Motorcycles	Gasoline	125	0.1%	Included above	CARB
Off-Road Vehicles	Gasoline and Diesel	187	0.1%	Data not available	CARB
Subtotal Transportation		**115,505**	**66%**	**1,581,280**	
Waste					
Total Waste Disposed (w/o ADC)					
	Paper Products	1,475	0.8%	0	Recology Auburn Placer
	Food Waste	578	0.3%	0	Recology Auburn Placer
	Plant Debris	155	0.1%	0	Recology Auburn Placer
	Wood/Textiles	434	0.2%	0	Recology Auburn Placer
Landfill					
	Waste-In-Place	4,855	3%	0	Auburn Sanitary LF
Wastewater Treatment					
	WWTP – Effluent	35	0.02%	0	Auburn WWTP
	WWTP – Process	30	0.02%	0	Auburn WWTP
	Septic	166	0.1%	0	Census Estimates
Subtotal Waste		**7,727**	**4%**	**0**	
Grand Total		**175,448**	**100%**	**2,393,747**	

Subtotals and grand total may not be the exact sum of individual category emissions due to rounding

Appendix B - Residential Sector Notes

Table B-1: Data Inputs

Residential	Electricity Consumption PG&E	kWh	45,803,194
	Natural Gas Consumption PG&E	Therms	2,760,250
	Liquid Propane Gas Consumption	BTUs	4,162,136,088
	Fuel Oil / Kerosene Consumption	BTUs	1,828,817,372
	Wood for Home Heating Consumption	BTUs	6,607,110,160

Table B-2: Data Sources

Electricity	kWH	Pacific Gas & Electric
Natural Gas	Therms	Pacific Gas & Electric
Liquid Propane Gas, Fuel Oil / Kerosene, Wood for Home Heating	Heating Degree Days	http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html
	Home Heating Estimates:	ACS B25040 Report, Home Heating Fuel, ACS 2005-2009 5-Year Estimates
	Space Heating and Water Heating Factors	Green House Gas Inventory Guidance, USEPA, Municipal Clean Energy Program, State and Local Branch http://climateprotection.org/pdf/Appendix-F-USEPA-Draft-Regional-Inventory-Guidance-1-20-09.pdf

Methods:

Utility Derived Data

Electricity and natural gas consumption data was collected from Pacific Gas & Electric Company (PG&E) for all facilities within the Auburn city limits. The data provided was broken out by residential, commercial and industrial use where possible. The residential electricity and natural gas data was entered into the Clean Air and Climate Protection software where the greenhouse gas emissions were calculated using PG&E's reported grid emissions factors for electricity and default combustion emissions factors for natural gas.

Non-Utility Derived Data

Liquid propane gas, fuel oil / kerosene and wood for home heating estimations were determined using three sources of data: heating degree days, home heating fuel type estimates and space heating and water heating factors. First, the heating degree days were determined for Auburn using the reported numbers by NOAA for the Sacramento drainage. Then, the number of homes within Auburn using liquid propane gas, fuel oil / kerosene or wood for home heating was determined by reviewing the 2005 – 2009 American Community Survey 5-Year Estimate for Housing by Home Heating Source. Next, the space heating and water heating factors were determined by reviewing the US EPA Greenhouse Gas Inventory Guidance. Once collected, the annual space heating totals in BTUs for liquid propane gas, fuel oil / kerosene and wood were calculated by multiplying the total 2005 heating degree days by the number households in Auburn using propane, fuel oil and wood for space heating by the respective EPA space heating factor. Please see factors and calculations in the table below. It was assumed that a home employing propane or kerosene for space heating uses the same fuel for water heating. Therefore the annual water heating totals in BTUs for liquid propane gas and fuel oil / kerosene were calculated by multiplying the number of households in Auburn using propane or fuel oil by the respective EPA water heating factor. It was also assumed that a household employing wood for space heating employs electricity, rather than wood, for water heating.

Table B-3: Home Heating Calculations

Fuel Type	Propane	Fuel Oil / Kerosene	Wood
Total 2005 Heating Degree Days	4,052.00	4,052.00	4,052.00
# Homes Using Other Fuels for Space Heating	66.00	29.00	140.00
Space Heating Factor (BTU/HDD/Household)	11,647.00	11,647.00	11,647.00
Water Heating Factor (BTU/YR/Household)	15,869,024.00	15,869,024.00	N/A
Annual space heating subtotal	3,114,780,504.00	1,368,615,676.00	6,607,110,160.00
= *(factor x HDD x # of households)*			
Annual water heating subtotal	1,047,355,584.00	460,201,696.00	N/A
= *(factor X # of households)*			
Total BTU	**4,162,136,088.00**	**1,828,817,372.00**	**6,607,110,160.00**

Appendix C - Commercial / Industrial Sector Notes

Table C-1: Data Inputs

Commercial	Electricity Consumption	kWh	54,692,724
	Natural Gas Consumption	Therms	1,126,562
Industrial	Electricity Consumption	kWh	Fails 1515 Rule: Included in Commercial Total
	Natural Gas Consumption	Therms	Fails 1515 Rule: Included in Commercial Total
Direct Access	Electricity Direct Access Residential	kWh	63,125.74
	Electricity Direct Access Commercial	kWh	19,851,001.34
Power Generation	Diesel Consumption	Gallons	1678
	Propane Consumption	Gallons	10

Table C-2: Data Sources

Electricity	kWH	Pacific Gas & Electric
Natural Gas	Therms	Pacific Gas & Electric
Direct Access	kWh	California Energy Commission
Power Generation	Fuel Consumption	Placer Air Pollution Control District

Methods:

Utility Derived Data

Electricity and natural gas consumption data was collected from PG&E for all facilities within the Auburn city limits. The data provided was broken out by residential, commercial and industrial use where possible. The commercial / industrial electricity and natural gas data was entered into the Clean Air and Climate Protection software where the Green House Gas emissions were calculated using PG&E's reported grid emissions factor for electricity and default combustion emissions factor for natural gas. Due to the limited number of industrial facilities in Auburn, PG&E was not able to release industrial electricity and natural gas data split out from the commercial data. Therefore, all industrial electricity and natural gas usage is contained within the commercial electricity and natural gas totals.

Direct Access Data

Direct access is energy supplied by a competitive energy service provider other than the utility, but uses a utility's transmission lines to distribute the energy. All direct access data was provided by the California Energy Commission and used in the direct access calculator (see below). The total direct access electricity consumption for Placer County was used to determine the percent of direct access for residential and commercial / industrial that was used in the calculation of the direct access electricity consumed within the City of Auburn. The calculated direct access totals for Auburn were entered into the Clean Air and Climate Protection software where the Green House Gas emissions were calculated using the California Grid Average emissions factor.

Table C-3: Direct Access Electricity Usage From CEC by County

Electricity Consumption (Million kWh)							
County	Sector	Year	Utility		Direct Access		Total
			Million kWh	%	Million kWh	%	
Placer County	Residential	2005	771.761	61.16%	1.064	0.59%	773
Placer County	Commercial/Industrial	2005	490.036	38.84%	177.861	99.41%	668
Total (Million kWh)			1,262		179		1,441
Total %			87.58%		12.42%		100.00%

Table C-4: Direct Access Estimate by Local Government

Sector	PG&E Total kWh	% DA Usage	DA kWh	Calculations to Estimate Proportion	
Residential	45,803,194	0.14%	63,125.74	0.14%	99.86%
Commercial/Industrial	54,692,724	36.30%	19,851,001.34	26.63%	73.37%

Power Generation Data

Power generation data was collected from the Placer Air Pollution Control District. The fuel usage in gallons was received for all stationary engines under permit in 2005. This was entered into the Clean Air and Climate Protection software to calculate the green house gas emissions. The default combustion emissions for diesel and propane were used.

Appendix D - Transportation Sector Notes

Table D-1: Data Inputs

Transportation	Local Roads (VMT)	Annual VMT	**57,848,850 Annual VMT**
		74.54% Gasoline By Vehicle Type	29.64% - Passenger Car 40.45% - Light Truck/SUV/Pickup 4.45% Heavy Truck
		24.53% Diesel By Vehicle Type	0.22% Passenger Car 0.01% - Light Truck/SUV/Pickup 24.29% - Heavy Truck
	State Highway (VMT)	Annual VMT	**71,449,960 Annual VMT**
		74.54% Gasoline By Vehicle Type	29.64% - Passenger Car 40.45% - Light Truck/SUV/Pickup 4.45% Heavy Truck
		24.53% Diesel By Vehicle Type	0.22% Passenger Car 0.01% - Light Truck/SUV/Pickup 24.29% - Heavy Truck
	Off-road Vehicles	Diesel (gallons)	11,696.52 Diesel Gallons
		Gasoline (gallons)	6,574.86 Gasoline Gallons
		CNG (gallons)	4,225.63 CNG Gallons

Data Sources:

On-Road Emissions

1. Caltrans, 2006. 2005 California Public Road Data. Division of Transportation System Information. Available at: http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf.
2. California Air Resources Board, 2011. EMFAC2011. Available at: http://www.arb.ca.gov/msei/modeling.htm

Off-Road Emissions

1. California Air Resources Board, 2007. OFFROAD2007. Available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.
2. Rail yard Miles Data Source – US Department of Transportation GIS Data

Sacramento Area Council of Governments – (916) 321-9000

Methods:

On-Road Emissions

Since actual fuel consumption data is not available at a jurisdiction level, on road emissions for local roads and state highways are estimated using vehicle-miles traveled (VMT) estimates coupled with vehicle type and fuel breakdown. The methodology for collecting and conditioning this data is as follows:

Local Roads VMT

Annual VMT on Local Roads are recorded by Caltrans' Highway Performance Monitoring System, which estimates VMT on local roads within various jurisdictions. Local roads annual VMT for the City of Auburn was taken from Caltrans 2005 California Public Road Data, and is shown in Data Inputs table above. Clean Air Climate Protection software identifies motorcycle emissions as an off-road emissions source. County-wide motorcycle CO2 emissions are produced in the California ARB's EMFAC2011 model. To produce motorcycle CO2 emissions specific to the City of Auburn, EMFAC2011 motorcycle emissions were disaggregated by applying the population ratio of 4.21% (ratio of Auburn population to county-wide population). EMFAC2011 produces daily emissions outputs, which need to be multiplied by 365 in order to produce annual estimates.

State Highway VMT

Table D-2: Jurisdiction share of recorded highway miles

	Jurisdiction	Total Highway Miles	US Hwy	State Hwy	Proportion
Placer Co		156.31	80.37	75.95	100.00%
	Lincoln	5.26	1.85	3.40	3.36%
	Loomis	1.21	1.21		0.78%
	Auburn	5.77	4.45	1.32	3.69%
	Non-Participating Cities	14.30	13.319315	0.98	9.15%
	Unincorporated Co	129.77			83.02%

Table D-3: Auburn share of highway VMT

Placer County Highway VMT	Auburn Share of Hwy Miles	Auburn VMT
1,935,587,700	3.69%	71,449,959

State Highway VMT attributed to Auburn is based on the amount of recorded highway miles within the jurisdiction, taken from Caltrans 2005 California Public Road Data. In order to estimate the State Highway VMT within Auburn, the proportion of 3.69% was multiplied by the total county-wide State Highway VMT recorded by Caltrans (311,151,550) to result in State Highway VMT value shown in Data Inputs table above.

Fuel/Vehicle Type Breakdown and Emissions Calculations

Since Caltrans does not provide VMT by fuel and vehicle type, fuel and vehicle type breakdown was extracted from California ARB's EMFAC2011 model, which provides this information by air basin. The EMFAC2011 model was run for example year 2005; daily VMT from this model was summed and proportioned by fuel and vehicle classification (Passenger Car, Light-Duty Truck/SUV/Pickup, Heavy-Duty Truck, and Motorcycles). These percentages were applied to the jurisdiction-specific annual VMT figures produced from the Caltrans report, resulting in final VMT figures by fuel and vehicle type. EMFAC2011 data was not used alone because this dataset was aggregated by air basin. Methods to disaggregate the EMFAC2011 data by city and county jurisdiction could not appropriately be developed so the above method was performed to produce VMT for each jurisdiction. This data was input into ICLEI's Clean Air and Climate Protection software which applies the appropriate emissions factors to produce the final CO2e emissions quantity.

Off-Road Emissions

Off-road emissions were estimated with standard procedures using California ARB's OFFROAD2007 modeling program. OFFROAD2007 produces emissions for various off-road, fuel-consuming machines at the county level. In order to produce disaggregated emissions data, it is necessary to only consider machines types that are operated within Auburn. For Auburn, construction & mining equipment, entertainment equipment, industrial equipment, lawn and gardening equipment, light commercial equipment, other portable equipment, railyard operations, selected recreational equipment, and transport refrigeration units were considered. This information was collected in an initial questionnaire distributed to a government staff person and additional information regarding machine operations was confirmed through phone calls and emails with Auburn's City Planner. After identifying the applicable machine classifications, the data was proportioned by population to represent Auburn's share of the emissions compared to the entire county. Further mapping analysis was conducted using GIS to proportion the amount of railways within each jurisdiction to appropriately disaggregate rail yard emissions. This map is available in the Off-Road Fuels Working Data tab in the Master Data Workbook for this inventory. The data produced by OFFROAD2007 is daily usage – the final data was multiplied by 365 in order to produce annual emissions. The final data that was entered into CACP was annual emissions of CO2, CH4, and N2O, in tons. The table below shows the proportions applied to each off-road machine category.

Table D-4: Off-Road Proportions by Category

Off Road Machine Type Category	Proportion Applied to OFFROAD 2007 County-Wide Output
Construction & Mining Equipment	4.21%
Entertainment Equipment	4.21%
Industrial Equipment	4.21%
Lawn & Gardening Equipment	4.21% - Filter out snow blowers
Light Commercial Equipment	4.21%
Other Portable Equipment	4.21%
Rail yard Operations	4.20%
Recreational Equipment	4.21% - Golf carts, mini bikes, and specialty vehicle carts only
Transport Refrigeration Units	4.21%

Appendix E - Solid Waste Sector Notes

Table E-1: Data Inputs

Waste – Auburn Landfill	Year opened / closed		1958-1983
	Dumped Waste	short tons	375,000
	Rainfall	inches/yr	35
	Associated k value		0.038
Waste Deposited	2005-Generated Solid Waste	short tons/yr	14,484

Data Sources:
Waste Deposited: General Manager Recology Auburn Placer
Auburn Landfill: City of Auburn Public Works
First-Order-Decay Model: www.arb.ca.gov/cc/protocols/localgov/localgov.htm

Methods - Solid Waste in Landfills and Dumps within Jurisdictional Boundaries:

There are a variety of emissions associated with solid waste management services including collection, processing, and storage of solid waste generated from residents and businesses. Collection emissions are included in the transportation sector of this report. The most prominent source of emissions from solid waste facilities is fugitive methane released by the anaerobic decomposition of organic waste over time in dumps and landfills. The scale of these emissions depends upon the size and type of the facility and the presence of a landfill gas collection system. Our analyses do not account for the biogenic production of CO2 during aerobic processes, including the burning of methane.

The Auburn Landfill is located within the City of Auburn. It received solid waste for disposal between 1958 and 1993. The facility has no methane capture. The California Air Resources Board's first-order-decay model was used to calculate 2005 methane emissions, using waste data provided by the City of Auburn's Public Works Department.

Methods – 2005-Generated Solid Waste:

Solid waste generated within the city in 2005 was transferred to remote landfills for disposal. The emissions associated with this waste are defined as Scope 3. They occur at the landfill sites over the entire period of decomposition (estimated to be 100 years). Scope 3 emissions were calculated using standard emission factors and equations adopted by the California Air Resources Board, the California Climate Action Registry, ICLEI - Local Governments for Sustainability and The Climate Registry.

Information on the waste collected from within the City of Auburn was received from Recology. The data was in the form of short tons/yr. Waste characterization values were provided by the California Integrated Waste Management Board (CIWMB) specifically tailored to 2005.

Table E-2: Waste Composition

Paper Products	Food Waste	Plant Debris	Wood/Textile	All Other Waste
21.00%	14.55%	6.89%	21.79%	35.77%

Appendix F - Wastewater Sector Notes

Table F-1: Data Inputs

Wastewater	Centralized	Ave Total Nitrogen Discharged	kg N / day	39.22
		Total Population Served	People	11,000
	Anaerobic Digester	Total Population Served	People	N/A
	Lagoon	Total Population Served	People	N/A
	Septic	Total Population Served	People	633
Census Bureau		Average Household Size	People	2.26

Data Sources:

Community Development Department, City of Auburn, 530-823-4211

US Census Bureau, http://www.census.gov/

Methods:

Within any community based green house gas inventory wastewater treatment will only account for a small portion of total emissions. Wastewater can be treated using either: centralized plants (with or without anaerobic digestion), lagoons, or septic systems. The two emissions associated with these processes are methane (CH_4) and nitrous oxide (N_2O); calculating the makeup and amount of emissions depends on the processes involved and the management practices employed. The City of Auburn's population uses two methods to treat their wastewater: treatment at one centralized plant and treatment through decentralized septic systems.

The Auburn Wastewater Treatment Plant (WWTP), a centralized system, treats influent using aerobic processes to degrade the organic content of the influent. The system also utilizes two processes, nitrification and denitrification, in order to reduce N_2O levels. In addition there are industrial and commercial sources which contribute to the organic loading of the influent. The plant does not employ an anaerobic digester, choosing rather to haul collected sludge away to a landfill. Using population served information and site-specific data on the daily nitrogen load within the effluent (collected by the city and shown in the Data Inputs table above), emissions were calculated with standard equations provided by ICLEI using IPCC methodology.

Residents not on the city's sewer system are by default on septic. These systems are able to serve either multiple or individual households. Septic treatment involves anaerobic processes to degrade organic matter, emitting primarily CH_4. Using the number of households connected to septic (provided by the city) and an approximation of the average population within a household (provided by the Census Bureau) CH_4 emissions were calculated with standard equations provided by ICLEI using IPCC methodology.

Appendix G - Agriculture Sector Notes

It was determined that agriculture within the city limits was insignificant; therefore all agriculture emissions were attributed to the County.

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